Electric vs Petrol or Diesel Car: Running Cost and CO_2 per km

Energy cost and CO_2 per kilometre of an electric car and a petrol or diesel car, with the yearly saving for a distance driven.

Method: Energy cost and emission arithmetic per kilometre

Input parameters

Unit system: SI

Parameter	Value	Unit
EV energy use at the wheels' battery (kWh per 100 km)	15.000	
Electricity price per kWh	8.0000	
Charging efficiency (grid to battery)	90.000	%
Fuel use of the other car (litres per 100 km)	6.5000	
Fuel price per litre	100.00	
Distance per year (km)	15,000	
Grid emission factor (kg CO_2 per kWh)	0.71000	
Fuel emission factor (kg CO_2 per litre; 2.31 petrol, 2.68 diesel)	2.3100	

Calculated results

Parameter	Value	Unit
EV cost per km	1.3333	
Fuel car cost per km	6.5000	
Saving per year with the EV	77,500	
EV CO_2 per km (g)	118.33	
Fuel car CO_2 per km (g)	150.15	

Notes for this case

• The EV draws its battery energy plus charging losses from the grid, so its cost per km is (kWh per km)/η_c × the electricity price and its CO_2 is that energy × the grid's emission factor. The fuel car's cost is litres per km × the fuel price and its tailpipe CO_2 about 2.31 kg per litre of petrol or 2.68 of diesel. Real consumption depends on driving, climate and air conditioning; purchase price, maintenance and battery life are left out.

Formula and method

$$C_{EV} = \frac{e_{EV}}{100\,\eta_c} c_e, \quad C_{ICE} = \frac{f}{100} c_f, \quad \Delta C = (C_{ICE} - C_{EV}) D$$

Variables

e_{EV}	EV energy use at the wheels' battery (kWh per 100 km)	-
c_e	Electricity price per kWh	-
η_c	Charging efficiency (grid to battery)	-
f	Fuel use of the other car (litres per 100 km)	-
c_f	Fuel price per litre	-
D	Distance per year (km)	-
e_g	Grid emission factor (kg CO_2 per kWh)	-
e_f	Fuel emission factor (kg CO_2 per litre; 2.31 petrol, 2.68 diesel)	-
C_{EV}	EV cost per km	-
C_{ICE}	Fuel car cost per km	-

ΔC	Saving per year with the EV	-
G_{EV}	EV CO_2 per km (g)	-
G_{ICE}	Fuel car CO_2 per km (g)	-

Method and standards

EV running cost.

Assumptions and limits

- Average consumption; energy cost only.

References

Energy cost and emission arithmetic per kilometre

Report details

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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/automotive/electric-vehicles/ev-vs-ice-cost-per-km

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.